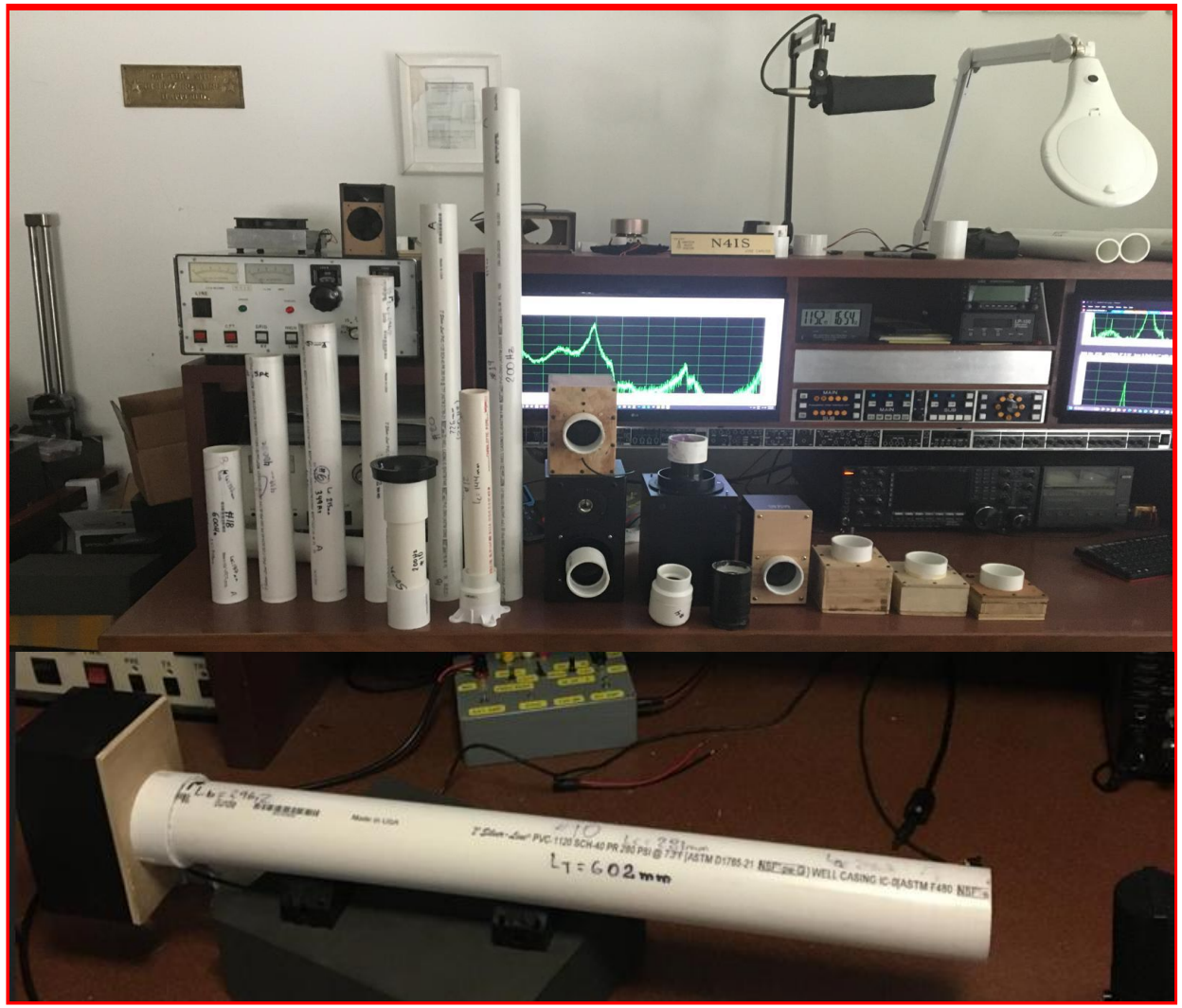
High Performance CW Speakers

Jose Carlos N4IS

Super Selective Speaker for CW 3-S

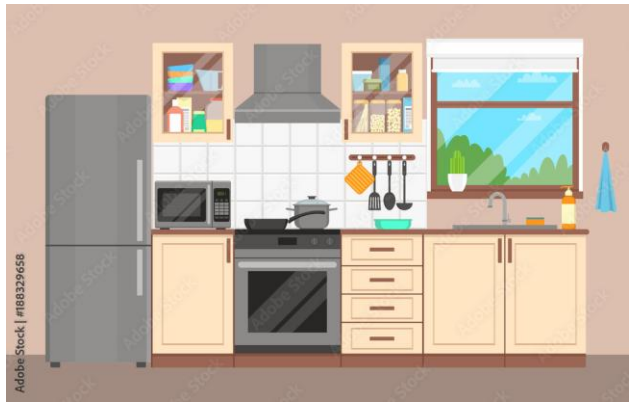
- The 3-S project
- What it is ?
- How o use it
- Skillset toolbox
- Live demo



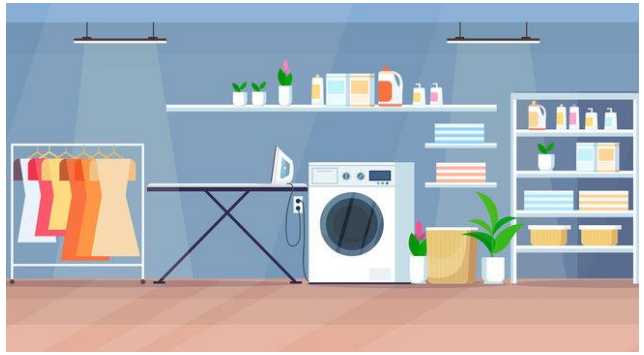
How this project started. 2017

WALL

Ed
N4II



Doug
NX4D



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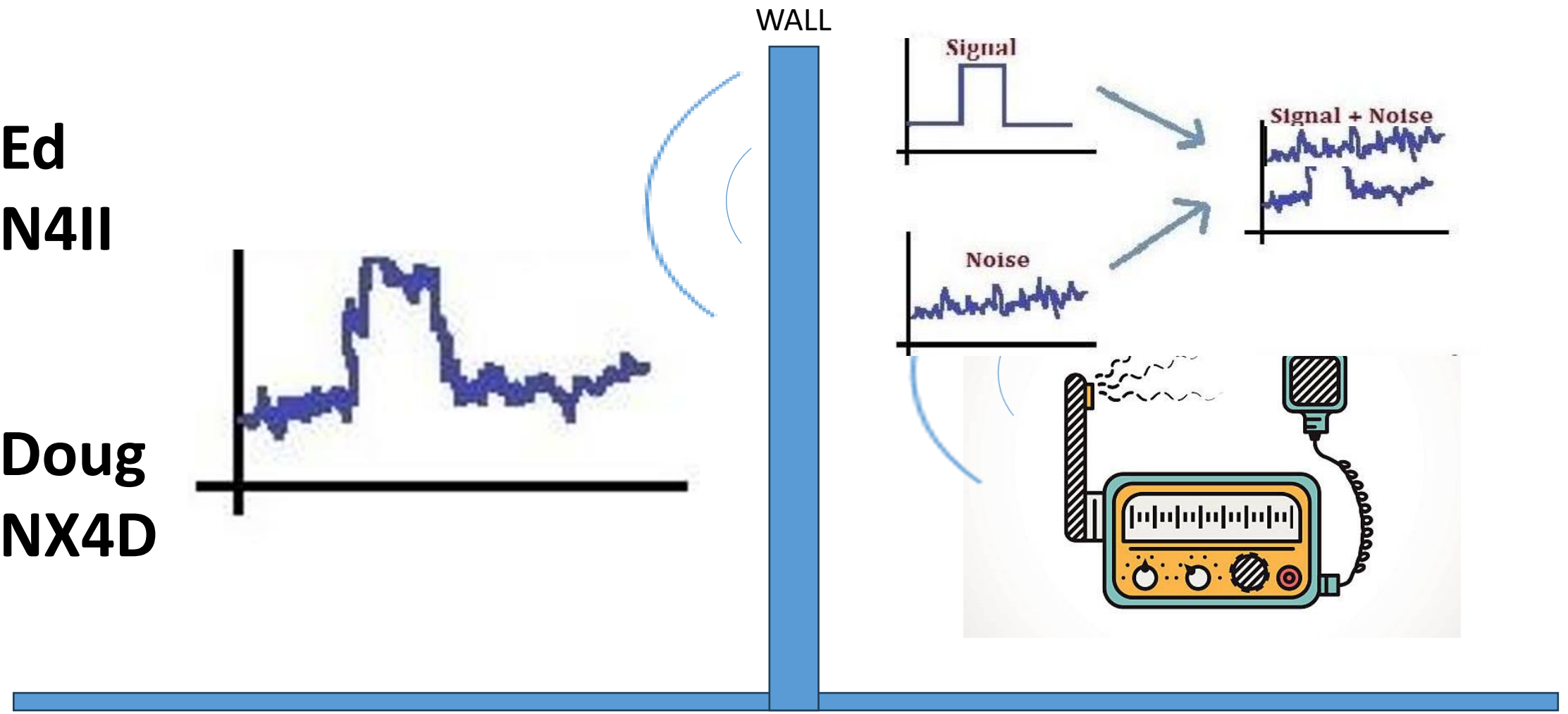
What was going on?

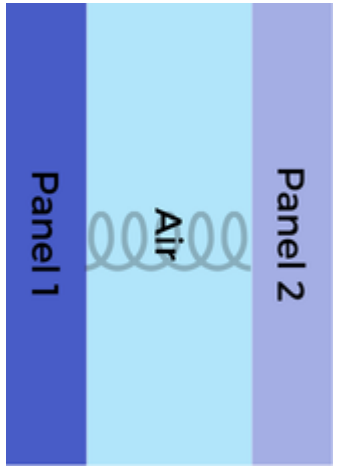
Ed
N4II

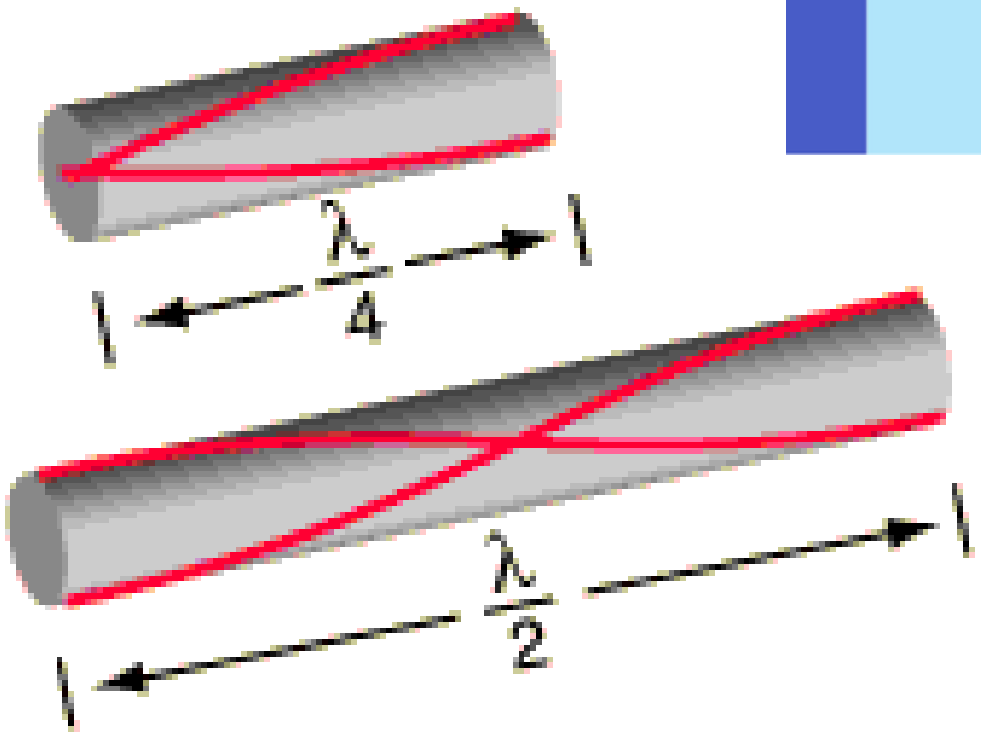
Doug
NX4D

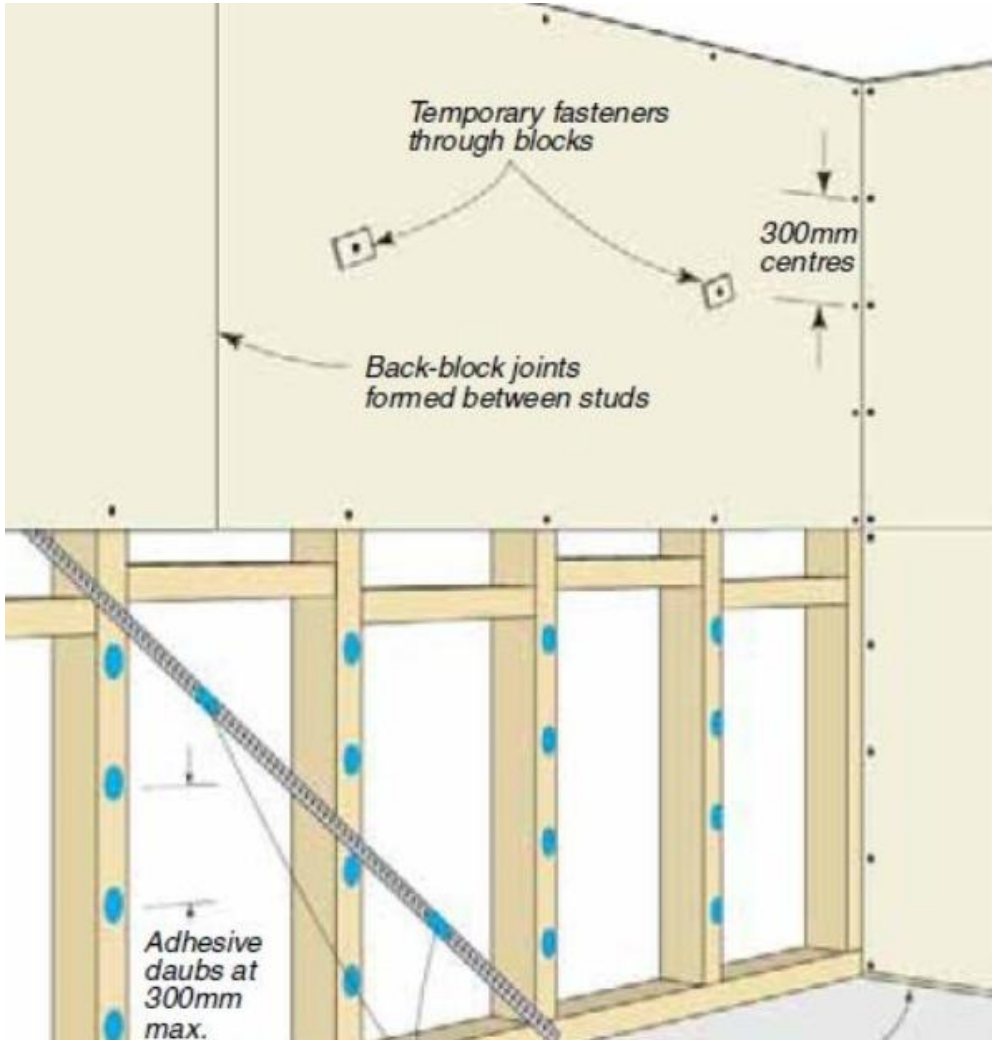


The wall is an acoustic filter.

Helmholtz Resonator

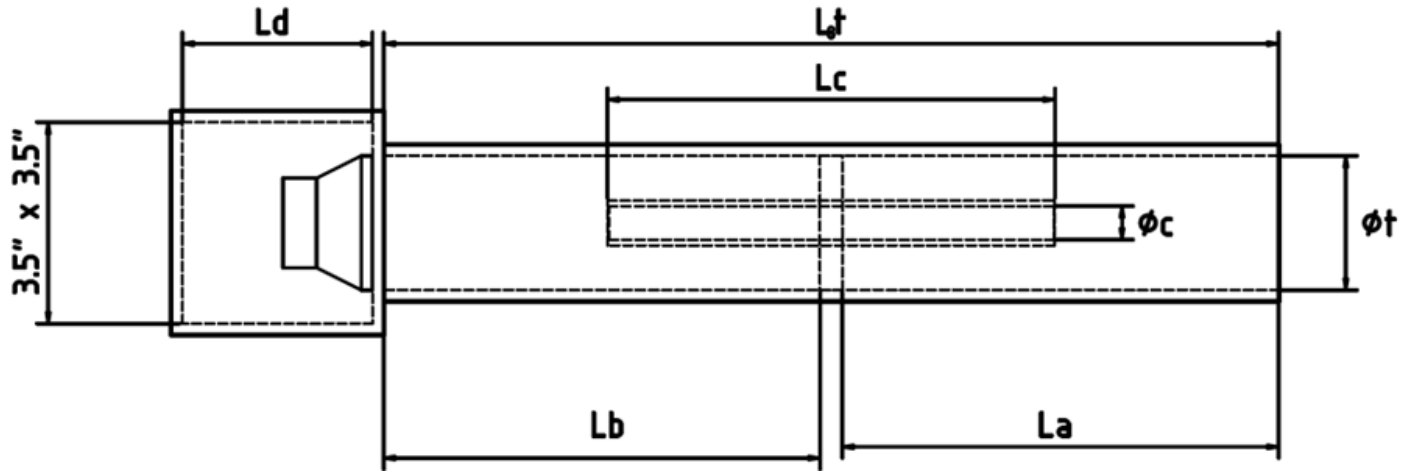






3S Super - Selective – Speaker 2025

La = Lb = Lc



Resonances

Fa = APS resonant frequency peak

Fn = Inner tube resonant frequency notch (2 x Fa, notch 2nd harmonic)

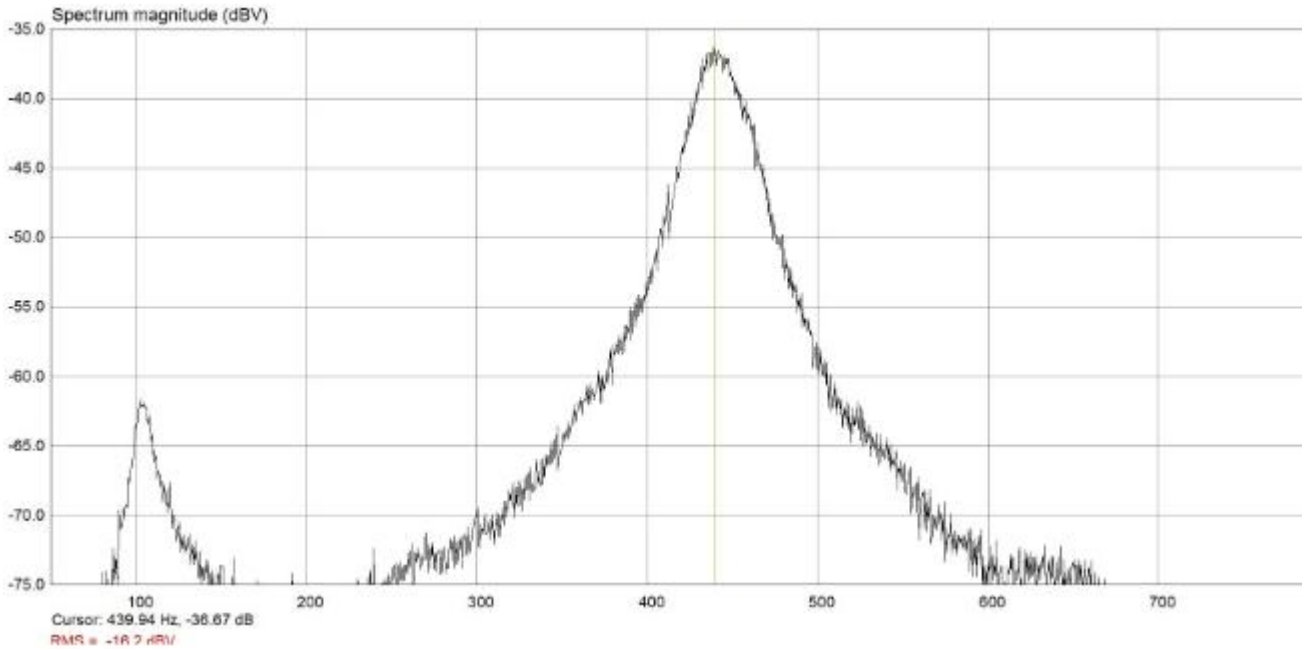
Fb = Speaker resonant frequency inside the sealed box

ARTA Spectrum Analyzer

https://artalabs.hr/

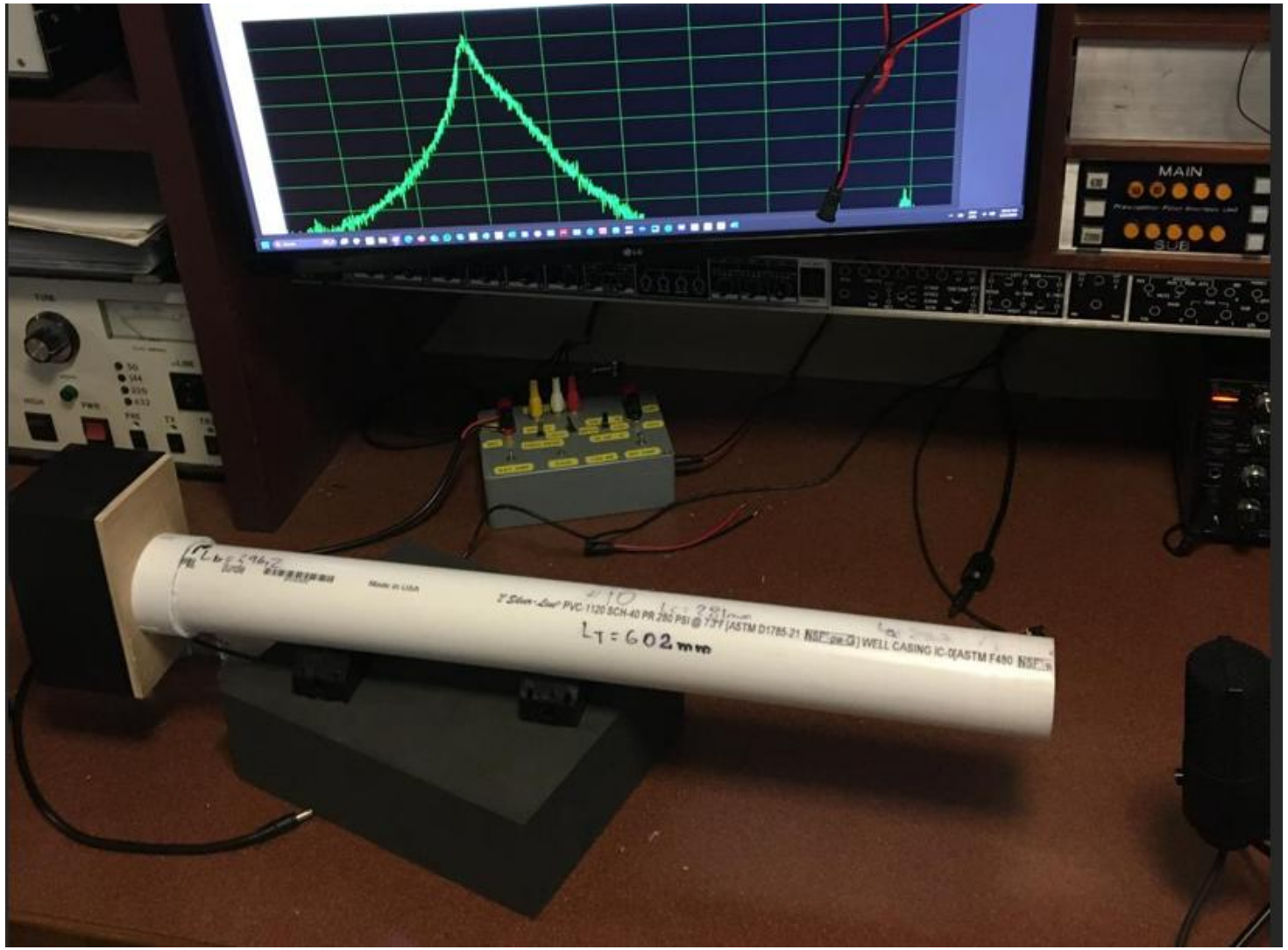
ARTA Software

USB Microphone, Metal Condenser Recording Microphone



Computer Sound Blaster sound card

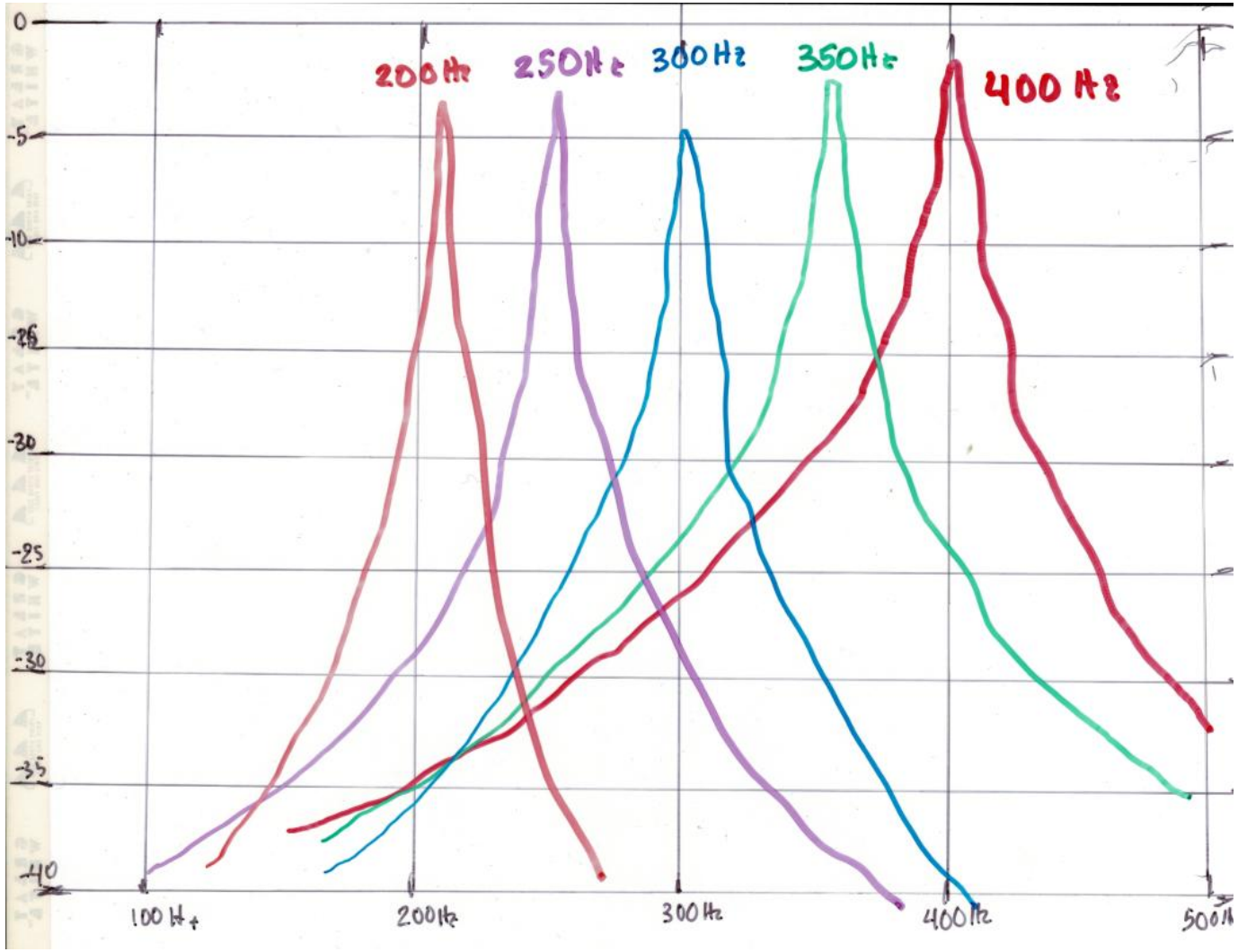
Build and tested over 100 filters



Biult and tested over 100 filters

Tested over 40 different speakers

Selectivity by CW pitch



+ 10 dB SPL

BASE LINE

90 dB SPL / 1W input

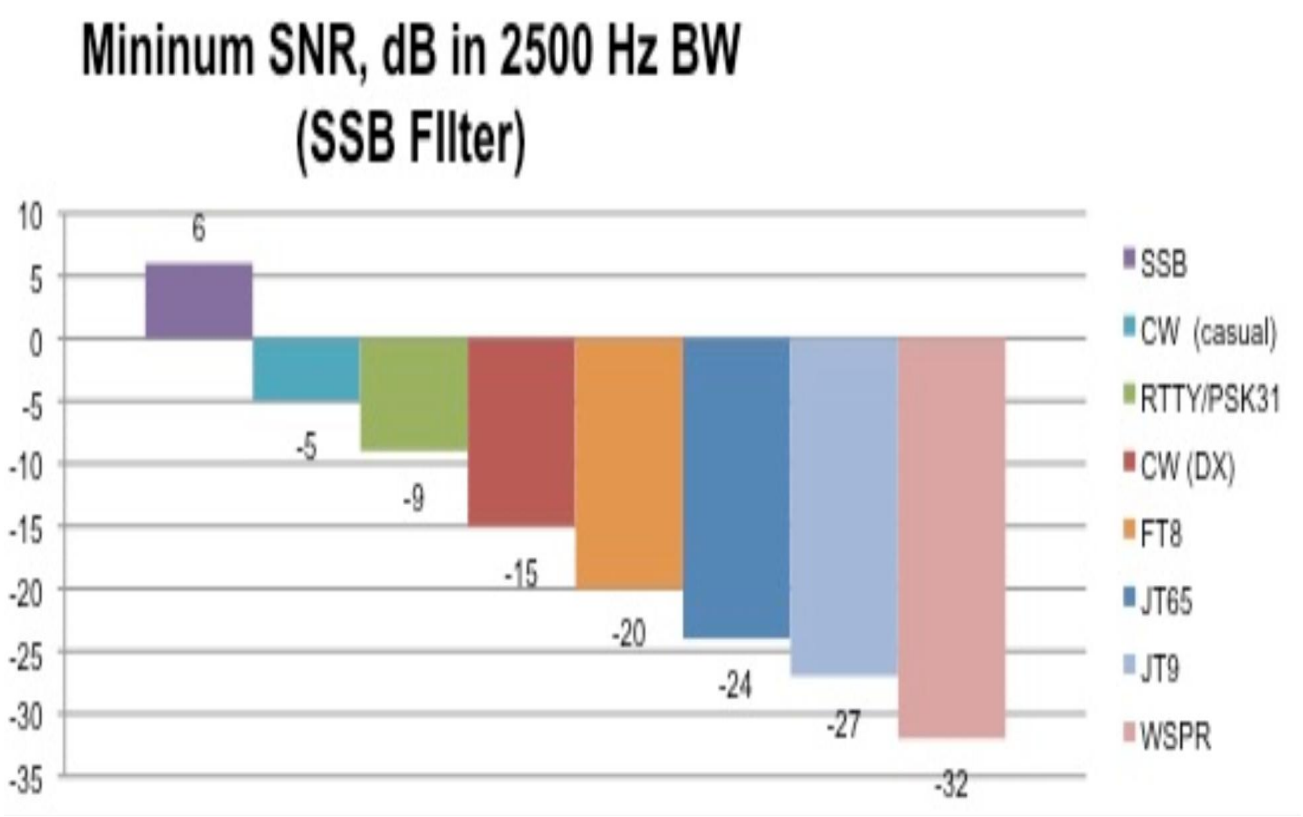
Speaker is a transducer
It transforms electrical power, W into dB, Sound Pressure Level

-40 dB SPL

Super Selective Speaker 3-S

N4IS 3S - APS		CW PITCH CENTER FREQUENCY Hz					
Feb 23,2025		200	250	300	350	400	600
SPL	Q	43.5	41.6	44	50	50	24
+10	BW db	BW Hz	BW Hz	BW Hz	BW Hz	BW Hz	BW Hz
+7	-3	4.6	6	6.8	7	8	25
+4	-6	6.6	10	9.5	13	15	35
0	-10	10.7	16	20	22	29	60
-10	-20	31	47	61	68	88	165
-20	-30	72	133	136	226	200	350
-30	-40	153	270	290	-	-	-
-40	-50	200	-	-	-	-	-

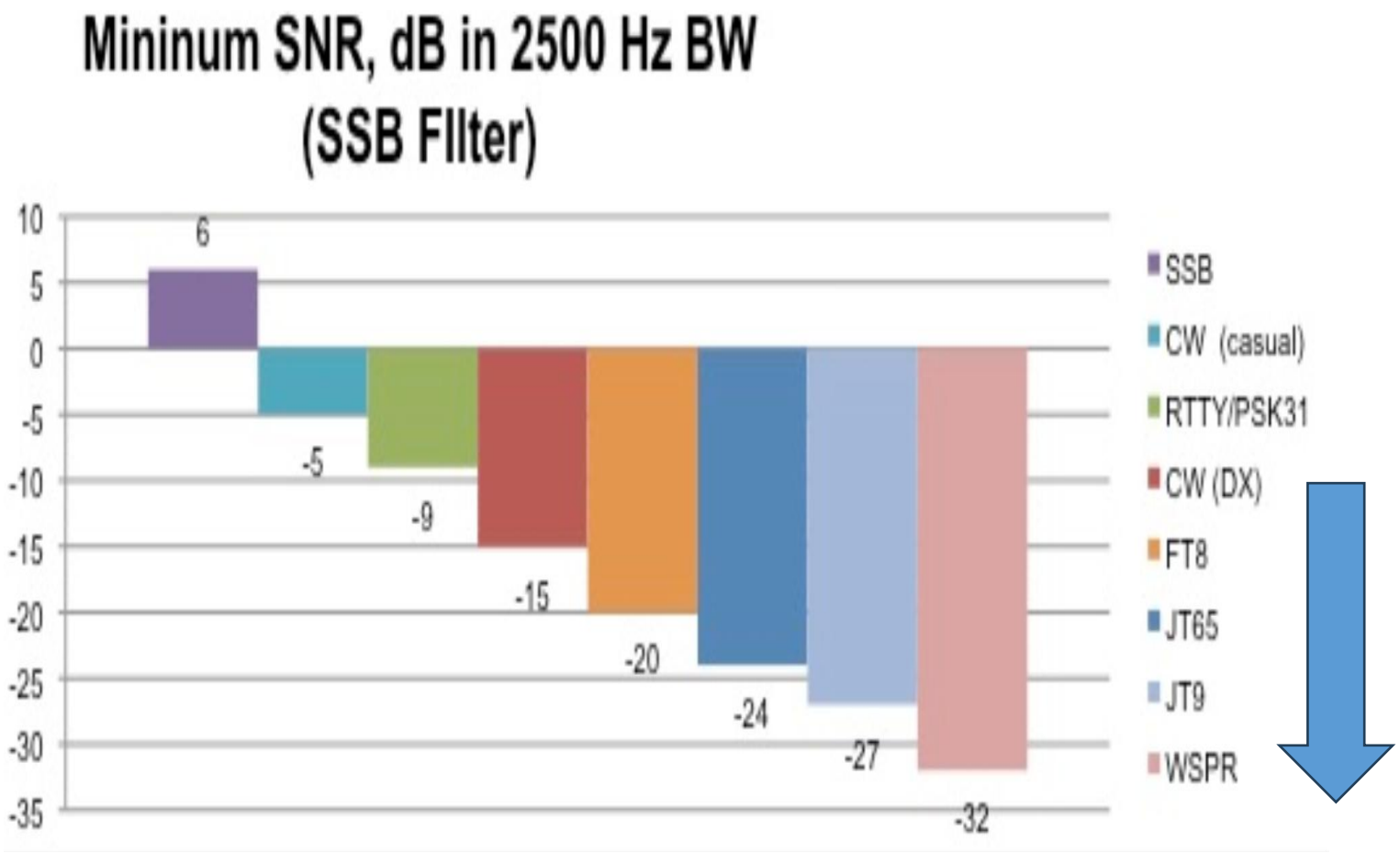
BANDWIDTH for weak signal modes



Human ear selectivity is

120 Hz BW near 1 KHz
and
90 Hz BW at 200 Hz

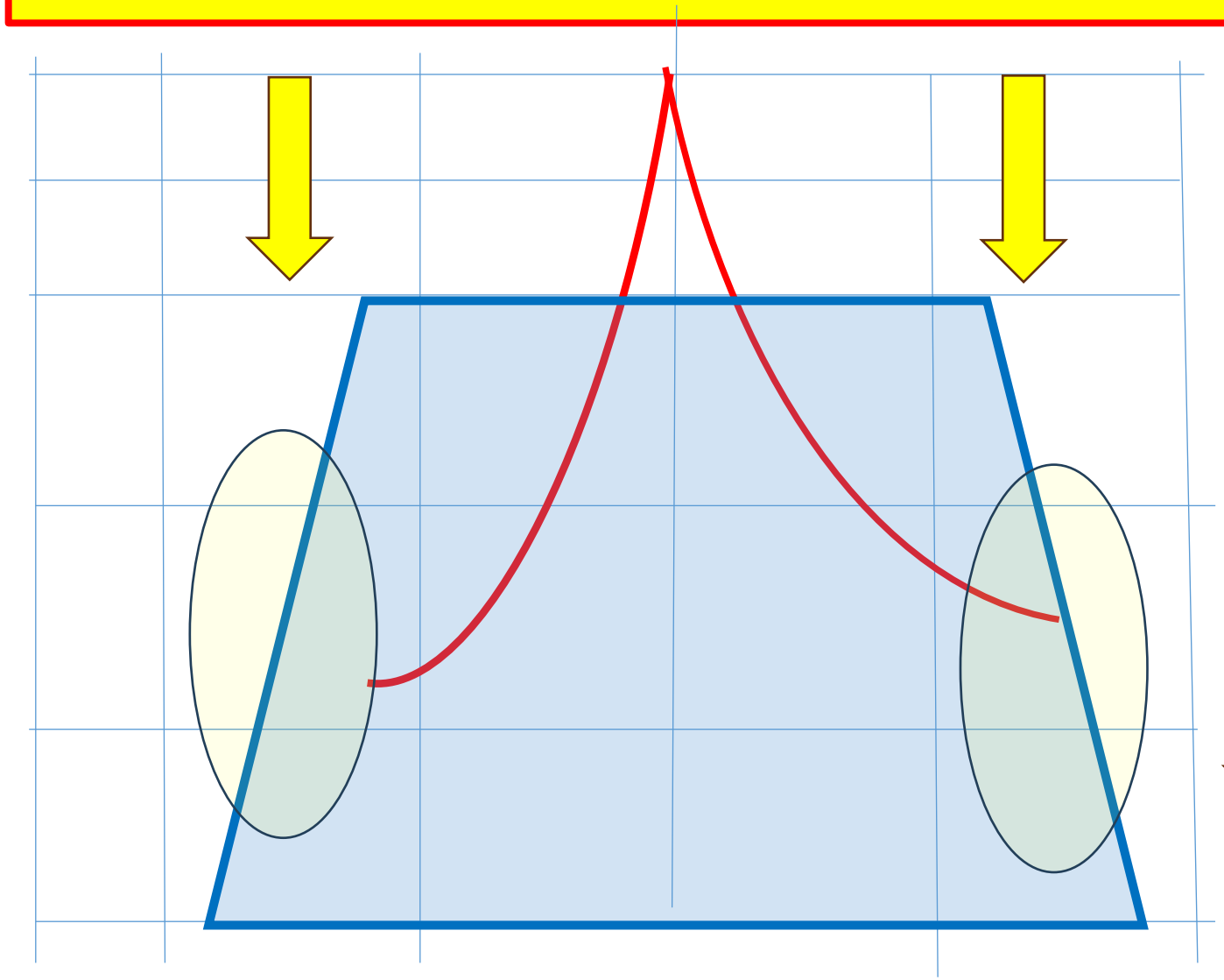
3-S SNR improvement



1975 Coherent CW
BW 9 Hz
CW speed 12 wpm
20 db improvement
over a 2.5 KHz filter

3S Speaker
BW 4 Hz – 8 Hz
improving up to 30 db

How to use and improve the Super Selective Speaker 3-S



3-S is a < 10 Hz BW AUDIO PEAK FILTER

RADIO RF FILTER

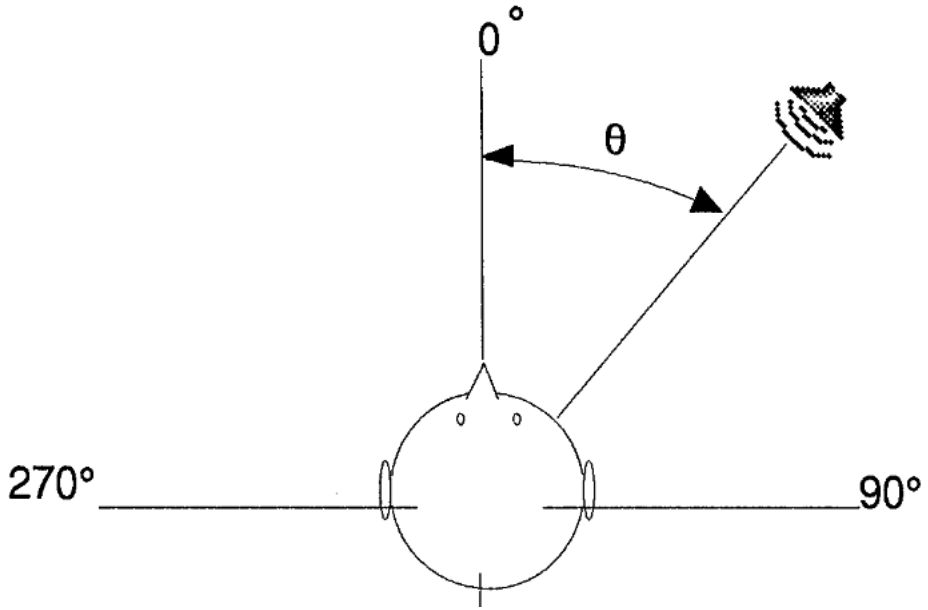
NOISE AT THE EDGE

ADJUST RADIO RF BW FOR BEST SNR 100 Hz to 400 Hz

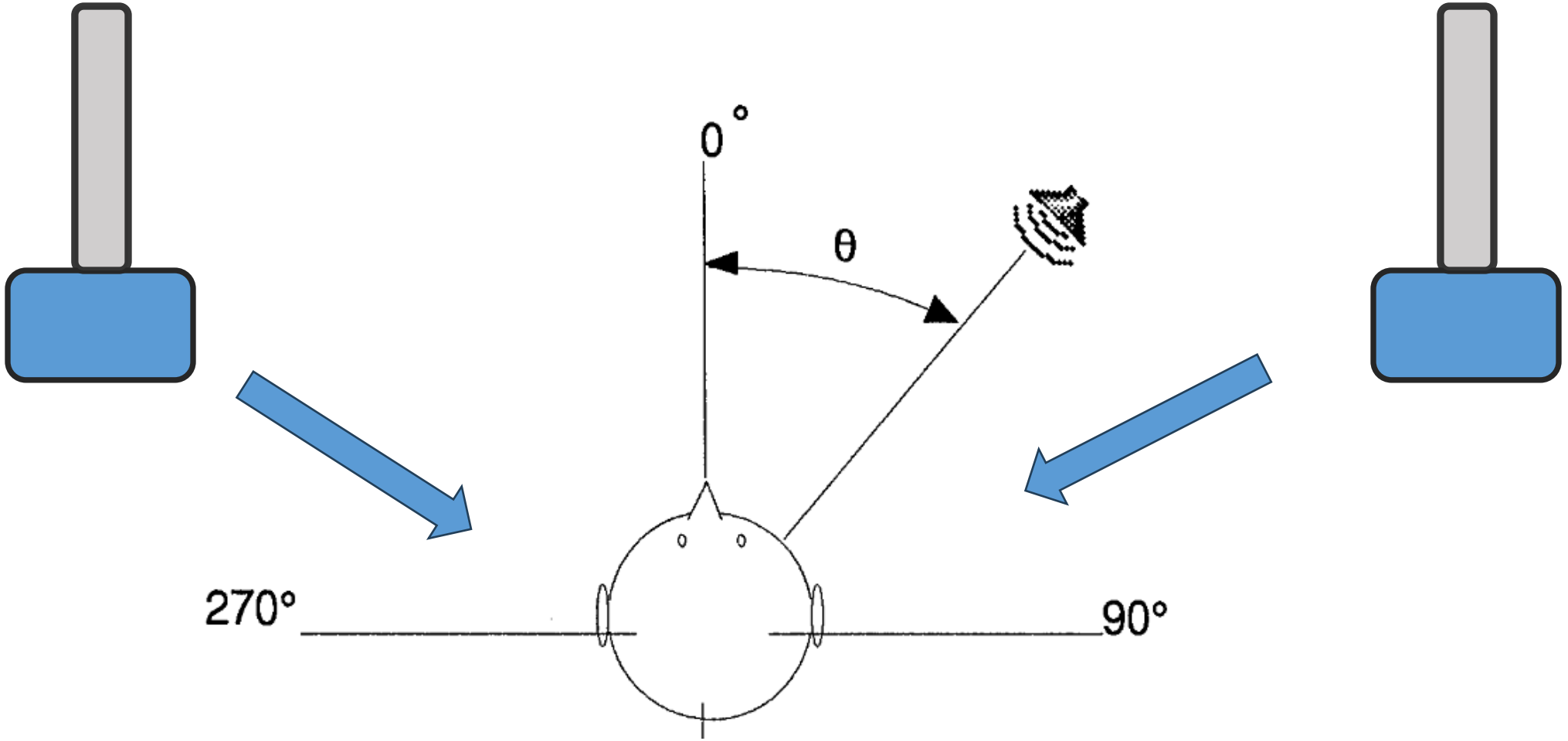
3-S with 3-D sound – another 6 db improvement

The ears are able to receive sound and localize from the entire space surrounding the head. 3-D sound gives the perception of placing sound in surrounding space. The ears and the brain, the human audio system, work together to process sound. The processing allows a listener to selectively focus on one sound

"cocktail party effect."

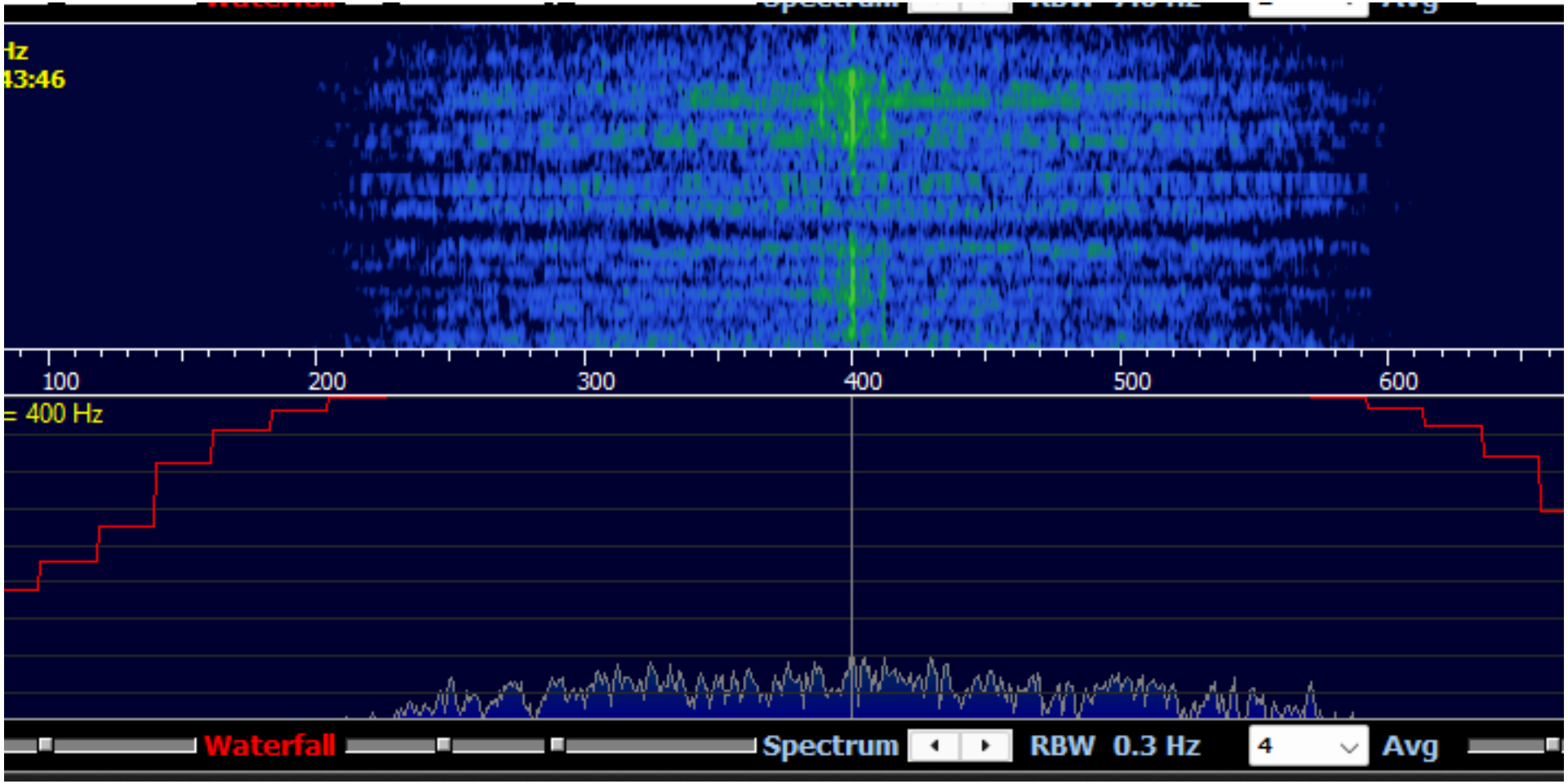


3-S with 3-D sound – another 6 db improvement

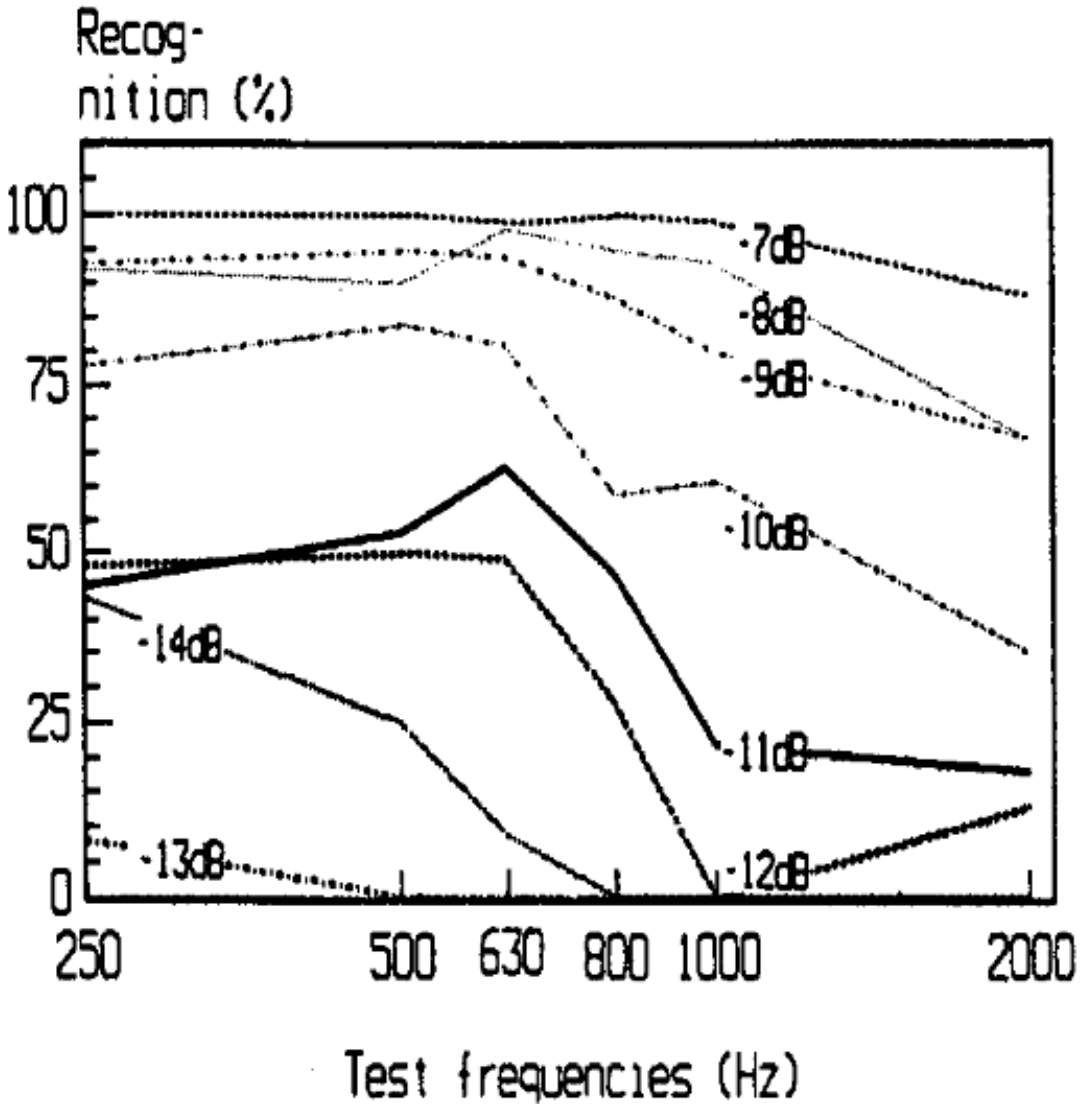


3-S is a great tool for your skill set

- DX Cluster and RBN + - 200 Hz
- SDR waterfall VBW < 1 Hz



CW pitch is all about the noise



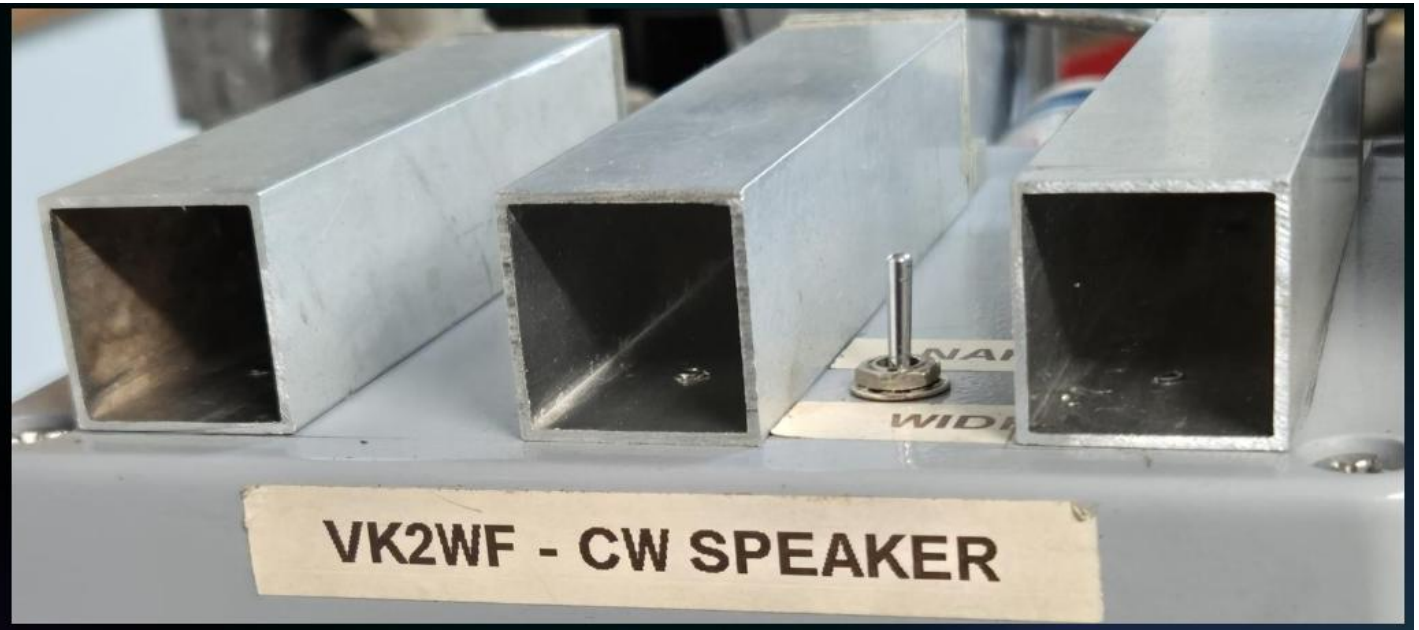
Median value of recognition for all subjects at different tone frequencies, Different SNR (-7 to -14 dB), and 16 wpm telegraphy speed

630 Hz is the logarithmic center of the human ear 20 Hz to 20 KHz

TOP BAND operators learned to use low cw pitch due QRN

PY1RO preference was 200 Hz CW pitch
W4ZV likes 250 or 270 Hz
350 Hz - 400 Hz is very popular too

VK2WF acoustic CW filter



CW Speaker Advantages

- No Headphones
- Copy signals not seen on a SDR receiver water-fall or heard on a conventional receiver, even at 50Hz BW
- Reduced Ringing as heard with narrow bandwidth filtering
- Less QRN tedium

VK2WF acoustic CW filter

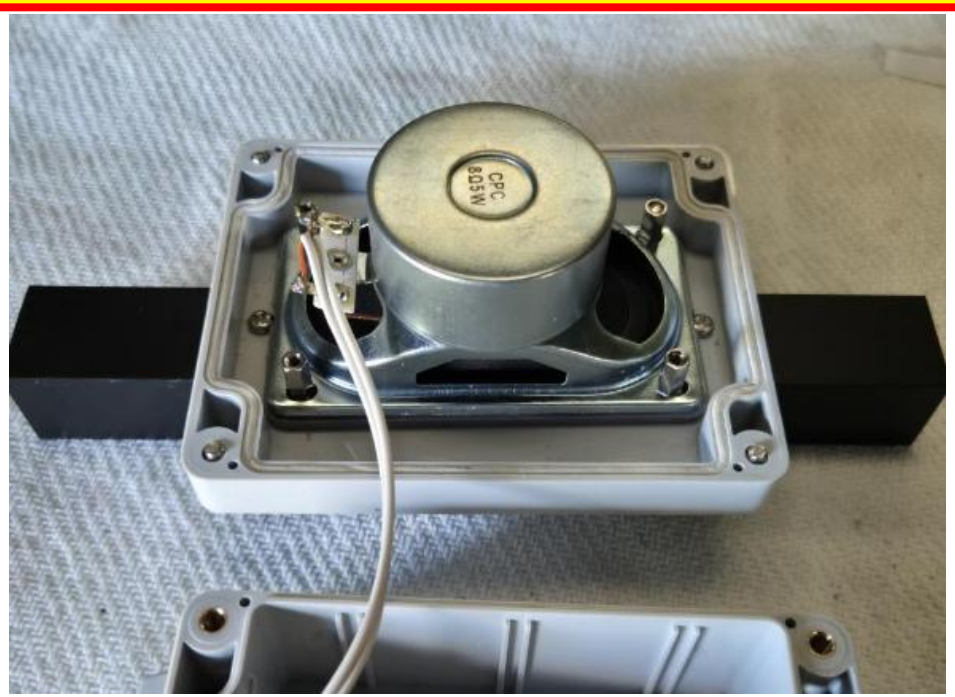
- The centre cavity is driven by one loud- speaker
- A second speaker is employed to compare tuned and broadband operation
- The outer 2 cavities are parasitic, giving increased noise reduction

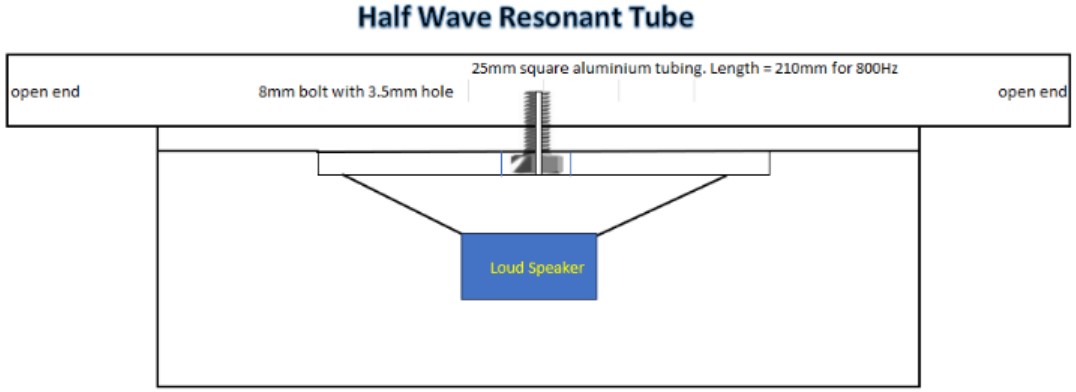
Quarter Wave Cavities

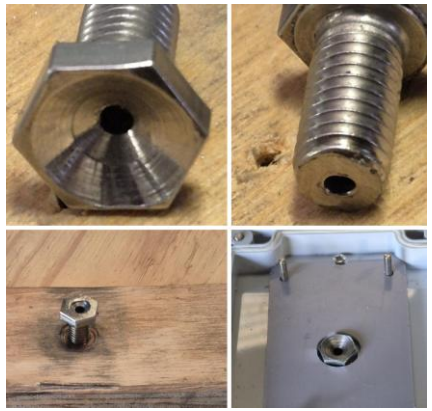
Being able to hear a Dx station before the others gives you a competitive advantage

- At sunspot cycle peak, Top Band conditions are poor, Acoustic Filtering still makes ATNO CW QSOs a possibility.
- 9M6NA is a recent example
- Signal strength mostly below noise floor

VK2WF acoustic CW filter







Youtube acoustic CW filter

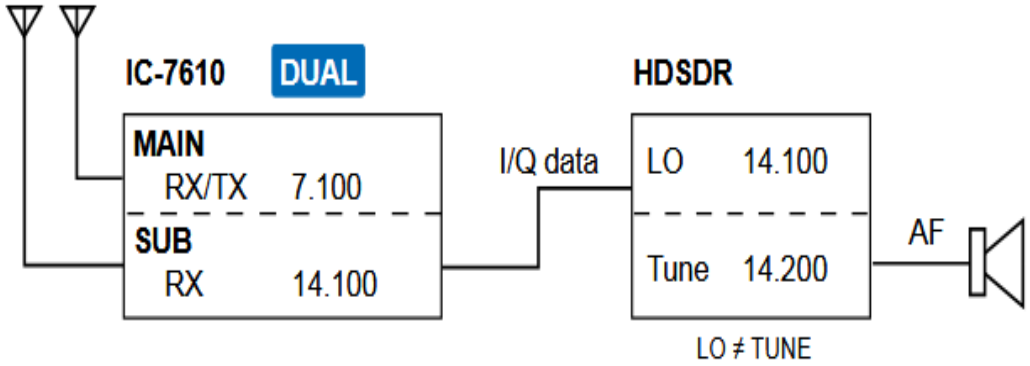
https://www.youtube.com/watch?v=seGoEtdW_NM

https://www.youtube.com/watch?v=C7KAT-HbriU

3S live demonstration using wav. and HDSDR

https://www.hdsdr.de/

IC-7610 with the HDSDR application



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